Estuary Explorers

at

Rookery Bay

National Estuarine Research Reserve

Educator's Guide

Acknowledgements

The following people and organizations were instrumental in the development and preparation of the Estuary Explorers school curriculum.

Laurel Chaplin – Rookery Bay National Estuarine Research Reserve
Amy Federico-Young – Laurel Oaks Elementary School
Randy McCormick – Rookery Bay National Estuarine Research Reserve
Craig Seibert – District School Board of Collier County
Louise Taylor – Blair Foundation
Jodie Viduri – Laurel Oaks Elementary School
Renee Wilson – Rookery Bay National Estuarine Research Reserve

Table of Contents

Table of Contents Continued:

Estuary Expedition Timeline	EG	SW	Duration	X
Prior to the Fieldtrip				
Reading "Welcome to RBNERR"	12	IC	5 min	
Pre Test on www.test.ccps	12		10 min	
What is a Watershed Anyway?	13	4	10 min	
Mapping Your Watershed	14,15	5,6	30 min	
It's Raining in the Basin	16		20 min	
Stewards of the Estuary KWL	17	7	10 min	
The Value of a Healthy Estuary	17	8	10 min	
Exploring Salinity	20	9	20 min	
Where Fresh Water and Salt Water Mix	21	9	15 min	
Mr. McGregor's Catch	22	10	15 min	
Solution Solutions	23	11	15 min	
Activities at Rookery Bay NERR				
The Environmental Learning Center				
The ELC Answer Hunt	27	13,14	10 min	
Protecting Coastal Resources	27	15	10 min	
Estuary Inhabitants	28	16	Variable	
Henderson Creek				
Checking Vital Signs	30	17	10 min	
The Epi Family: Flora and Fauna	31	18	15 min	
Nature Trail				
Box Turtle Trail	32		60 min	
After the Fieldtrip				
Transportation Time	34			
Finish Field Work Computations		17,18	Variable	
Rookery Writing		19	Variable	
Estuary Impressions		20	Variable	
In Your Classroom				
This is Our Watershed	34		Variable	
Checking Vital Signs: Data Analysis	35			
Science Finding Solutions	35		15 min	
Captains of Conservation	36		Variable	
Estuary Experts (complete KWL)	36	7	10 min	
Post Test on www.test.ccps			10 min	
Art Extensions	37		Variable	
Program Assessment	49		5 min	

Estuary Explorers at Rookery Bay

Welcome

An amazing world exists within the 110,000 acres of pristine mangrove forest, uplands and protected waters of the Rookery Bay Reserve. Where rivers and streams meet the sea, the unique estuarine habitat is formed. A remarkable diversity of wildlife, including 150 species of birds and many threatened and endangered animals, thrive in the estuarine environment and surrounding upland habitats and scrub found within the Reserve.

Rookery Bay is considered to be one of the few remaining, relatively pristine mangrove estuaries in the United States. Mangroves are among the most threatened habitats in the world. Researchers believe that more than 50% of the original mangrove forests have been lost. Many others are damaged or in peril.

Rookery Bay was designated as a National Estuarine Research Reserve in 1978, granting federal protection to this unique region. The Reserve System is a protected network of 26 unique estuarine ecosystems in the United States dedicated to long-term research, environmental monitoring, and education. The mission of the Rookery Bay Reserve is to provide a basis for informed decisions in the community and to promote coastal stewardship.

On the banks of Henderson Creek, the Environmental Learning Center at Rookery Bay is a perfect destination for students and teachers to explore the fascinating world of the estuary. There is no doubt that students will have close encounters with estuary residents. A visit to the Reserve will also empower students to think critically about our region's water concerns, the value of our coastal resources, and ways they can do their part.

Estuary Explorers was created to help you and your students understand more about our region's amazing coastal resources. The Field Trip Specialist Training coupled with this Teacher's Guide will give you step by step instructions for completing all the classroom and field activities with confidence and understanding. This unit focuses on strands G and H of the Sunshine State Standards, "How Living Things Interact with Their Environment" and "The Nature of Science," respectively. All the activities have been structured for educational effectiveness and incorporate critical thinking strategies, high level questioning and scientific techniques.

Planning Your Field Trip

Estuary Explorers at Rookery Bay is an exciting addition to your science curriculum. All educators interested in having their class participate in this opportunity must attend an educator workshop at Rookery Bay NERR. The Collier County School District Science Coordinator will advertise these trainings. Participation in this program constitutes a promise that educators will complete all activities in their entirety with students attending the field trip. A Rookery Bay staff member or volunteer docent will assist you for portions of this program; however, teachers are responsible for the actual instruction to their class.

Reservations
Due to limited space, reservations are on a first-come, first-served basis. Please be prepared with several scheduling options. Educators may make reservations at the Estuary Expedition Educator Workshop, or by calling Rookery Bay at 239-417-6310.

Cancellations
Please contact Rookery Bay at 239-417-6310, at least 48 hours in advance, if you need to cancel or reschedule your fieldtrip. We cannot guarantee availability for rescheduling. If weather conditions are questionable, you can still enjoy a great portion of the trip. Call the reserve as early as possible on your scheduled day for guidance.

Fees
Upon completion of the teacher training, Field Trip Specialists participate in this program free of charge. Information will be available at the Estuary Explorers Educator Workshop regarding the availability of complimentary or subsidized transportation.

Pre-Trip Requirements
Allow time to complete all the pre trip lessons in this guide. The skills and concepts introduced are fundamental to a successful Rookery Bay experience.

Four adult chaperones per class, in addition to the educator, are required for the Estuary Explorers field trip. You will learn how to organize your student groups at the educator workshop. PLEASE organize your small groups PRIOR to your arrival.

With valid reason, additional chaperones may be allowed. Please contact the Rookery Bay Education Coordinator for information at 239-417-6310. Copy the chaperone sheet in the reproducible section of this guide. Please send out this information in advance so chaperones can familiarize themselves with the information

If you have challenging students, please advise the education department so the most effective Rookery Bay representatives can facilitate your group.

This trip includes time outdoors. Fire ants, poison ivy and mosquitoes may be encountered. All students, teachers and chaperones should wear closed toed shoes and lightweight long pants. Please notify parents of this in advance.

Rookery Bay Group Reservations Form

To reserve a date, fax this form to Rookery Bay at 239-417-6315. Please have several dates in mind when scheduling, as limited dates are available. You will be contacted with a confirmation date. If you have questions, call 239-417-6310.

Program Information

Program Date: 1st choice_____ 2nd choice _____ 3rd choice _____

Time of arrival at RBNERR _____ Return departure time _____

Program Title: ***Estuary Explorers***

Contact Information

Name of School: _____

Address: _____
Street City Zip

Teacher: _____

Phone Numbers: _____

Email: _____

Best method to contact (circle) Phone Email
If by telephone, when is the best time to contact you? _____

Classroom Information

Grade Level _____

Number of Students _____ Number of Chaperones: _____ (min. 4)

Date of Field Trip Specialist Training _____ Verification ☐

Special Considerations

Field Trip Logistics

Preparing for classroom departure

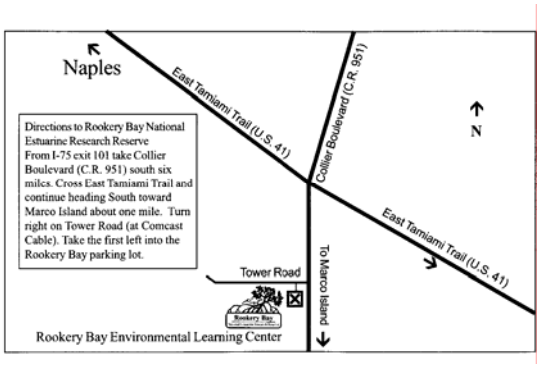
- ✓ Each student and adult should wear a legible name tag
- ✓ Each student should wear closed toed shoes and lightweight long pants
- ✓ Make sure Estuary Explorer Student Workbooks come with students; no copies will be available at Rookery Bay.
- ✓ Review individual student responsibilities for the Checking Vital Signs lessons.
- ✓ Be sure you are aware of students who have allergies or may be in need of medication. Make provisions for these students ahead of time.

Items students should bring

Estuary Explorer Student Workbooks, Pencil, Water Bottle (suggested), lunch. Sunscreen and non-aerosol insect repellent are also recommended.

Arriving at Rookery Bay

Limited bus parking is available in front of the Environmental Learning Center (ELC). Please confirm your departure time with the bus driver and inform the Rookery Bay representative.



Public restrooms are available inside the ELC and outside in the rear of the building. A water fountain is located near the indoor restrooms.

Lunch coolers may be kept in the bus or inside the ELC, under the benches to the right of the theatre entrance. No food is available at the facility. Picnic tables are located behind the ELC and are available on a first-come, first-serve basis.

Field trip agenda

Enter through the doors on the right of the ELC. Proceed to the theater and watch the Rookery Bay video. (10 min.) After the video, half of the class will accompany the teacher to the ELC to begin group activities in the Center and outside by the dock on Henderson Creek. A Rookery Bay representative will escort the remaining students on the Box Turtle Trail Hike. Each of these components (the ELC & Dock) and the trail hike will take 1 hour. After the teacher led group is finished, please encourage all students to use the restrooms and continue down the gravel road to the bridge. The Rookery Bay representative will meet you in this area to change groups.

Timing is everything!

Transportation schedules often dictate the length of your fieldtrip day. Timing of activities is based on a 2 ½ hour visit. Allow additional time if your class will be eating lunch at the Reserve. Please wear a watch and keep track of the day's schedule so all activities are completed. If your group has extra time, additional activities and computations are included in the Student Workbook.

Student Vocabulary

Brackish Water: a mixture of salt water and fresh water found where rivers meet the sea

Coastal Resources: land, water and life forms that exist along a coast

DDT: a toxic group of chemicals that was used for killing insects, now illegal in the U.S.

Ecosystem: a system formed by the interaction of a group of plants and animals with their environment

Elevation: the height of land above the level of the sea

Epiflora: underwater plants that live on the bottom or attached to a submerged surface

Epifauna: underwater animals that live on the bottom or attached to a submerged surface

Estuary: a partially enclosed coastal body of water containing brackish water

Invasive Exotic: a non-native plant or animal that takes space and food away from native species

Fresh water: water from lakes, rivers, streams or aquifers containing no salt

Habitat: the environment or home where a plant or animal lives

Model: a miniature representation of an object or process

Native Species: a plant or animal naturally and historically found in a geographic region

Rookery: an area where birds or other animals gather to nest and raise young together

Runoff: water that flows across the surface of the land and empties into a body of water

Salinity: the amount of salt in water, figured by the number of grams of salt in each thousand grams of water (parts per thousand or ppt)

Scientific Method: specific series of steps scientists use when making an investigation

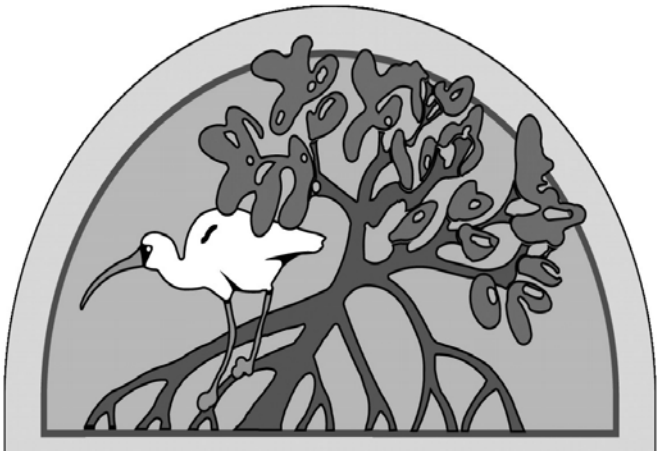
Seawater: salty water from the ocean or gulf

Stewardship: actions taken by people to improve and protect the health of the environment

Tides: the daily rise and fall of ocean waters caused by gravity from the moon and sun

Upland: land that is normally dry and located at a higher elevation

Watershed: an area of land that contributes its surface water flow to a particular water body.



Estuary Explorers

Classroom Lessons and Labs <u>Before</u> Your Field Trip

Laying the Foundation

An Introduction to Rookery Bay

Welcome!

Duration
15 min

Student Workbook
Inside Cover

Notes

Instructor Information

The student page gives a brief overview of the Reserve's mission.

Student Activity

1. Introduce the Estuary Expedition Student Workbook.
2. Read welcome on inside cover. Discuss
3. Take Pre-Test (www.test.ccps)
4. Introduce Vocabulary

What is a Watershed Anyway?

Students will Define the Word Watershed and Describe how a Watershed Works.

Duration
10 min

Student Workbook p.4

Notes

Instructor Information

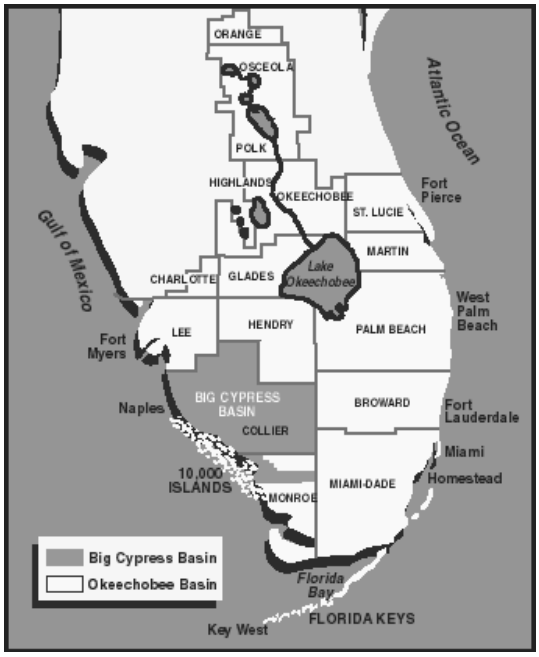
A watershed is an area of land that contributes its surface water flow to a particular body of water. They are also called drainage basins. In southern Florida water has a unique way of flowing over the land called sheetflow. Water also flows through rivers, streams and drainage canals toward the ocean. Water flowing under the land has percolated through the bedrock into the aquifer. Every drop of rain that falls in our watershed that is not consumed or evaporated will eventually flow into the Gulf of Mexico.

A watershed can aso be called a drainage basin. The boundary of the basin is created by land that is higher in elevation. This natural higher elevation directs runoff toward a major drainage feature, such as a stream, lake, bay, or ocean.

The watershed that we all live in is called the **Big Cypress Basin**. The basin covers about 2,470 square miles. The northern boundary of the watershed is the Caloosahatchee River. The Immokalee Rise, a sandy ridge that was formed when the sea level was higher is the eastern boundary

Student Activity

1. Have students turn to page 4 of the student workbook.
2. Study the map; can students locate anything familiar on the map?
3. Read the text out loud.
4. Discuss the definition of a watershed.
5. Discuss how a watershed works.
6. The page says that eventually all the water will end up in the Gulf. This is not necessarily true. Discuss where else water might go. [Evaporation, consumption by plants and animals, soaks into the aquifer – a natural underground water storage area.]



Mapping Your Watershed

Students will create a map of the Big Cypress Basin.

Duration
30 min

Materials
Overhead projector or Document camera
Colored pencils
Transparency set

Student Workbook pp. 5-6

Student Enrichment
Write a story describing the journey of a raindrop through the Big Cypress Basin

Notes

Instructor Information

This map-making exercise focuses on the elements that have impacted the flow of water through our watershed. The Big Cypress Watershed includes all of Collier County and significant parts of Lee, Hendry, and Monroe Counties.

Student Activity

1. Show students the pre-settlement habitat map. Discuss. What are the predominant colors? How does looking at the map make them feel?
2. Show students the current habitat map. What differences do they notice? Can they guess what any of the colors represent? How does looking at the map make them feel?
3. Tell students that they will each create a map of their own watershed.
4. Pass out colored pencils and have students turn to Student Workbook p. 5.
5. Display *transparency A.*
6. Overlay *transparency B.*
7. Have a student read and follow directions.
8. Continue overlaying transparencies in order and having students read and follow directions on each.

Save for copies of transparencies **Rotate map**

Mapping Your Watershed
Discussion Questions

If a watershed can be seen as a basin or bowl, The Immokalee Rise represents what part of the bowl?
(The rim)

Is there a natural barrier for the western or southern boundaries for our watershed?
(No, water flows into the Gulf of Mexico.)

Does any of the surface water flowing through the Big Cypress Basin go to the Everglades?
(Yes, surface waters flow across the western edge of the everglades).

Why are conservation lands important?
(They provide habitat for wildlife, help keep our water supply clean, areas where water can soak into the aquifer, provide recreation, etc.)

Save for copies of transparencies **Rotate map**

It's Raining in the Basin

Optional

Duration
20 min

Materials
Large sheet or Parachute
Blue balloons

Notes

Instructor Information

This activity reinforces understanding of the form and function of our watershed. It takes some space and would be great to complete outside

Student Activity

1. Explain that students are going to create a **model** of the watershed. A model is a miniature representation of something.
2. Spread the sheet out flat on the ground.
3. Using the student map as a reference, assign the following positions:
   - Caloosahatchee River (3 students)
   - The Coast (3 students)
   - Immokalee Rise (3 students)

   Have these students position themselves around the sheet to recreate the boundaries of our watershed, grasp the sheet and simulate the elevation of their location. Make sure the" Immokalee Rise" side of the sheet is held up high using their arms or by attaching the sheet to something. Coastal students need to make sure that their area stays anchored to the ground.
4. Explain that many people see Florida as a flat state (no mountains or hills) but actually our state has subtle changes in elevation. Can students think of areas that might have higher elevations? (Habitats -Pine Flatwoods, hammock, residential areas, roads).
5. Assign one student to represent each of the higher elevation areas.
6. Challenge the students with *naturally* higher elevations to represent themselves using the watershed sheet. Students can put chairs, their bodies, etc under the sheet causing it to rise "to a higher elevation".
7. Choose several students to represent raindrops. Give each raindrop a blue balloon.
8. Explain to the class that they will be using this model to show how rain flows through a watershed to the Gulf of Mexico. Examine the model. Do they think the raindrops will make it to the Gulf? Why or why not?
9. Position the raindrops around the model and have the students release their balloons as if rain were falling over the watershed. Observe what happens and discuss.
10. Add the students representing man made areas of higher elevation to the watershed model. A student holding a yardstick under sheet might represent roads.
11. Repeat the rainstorm. Observe. Compare and contrast the results.

Stewards of the Estuary

Student Knowledge Assessment

Duration
10 min

Student Workbook p. 7

Notes

Instructor Information

Starting with this KWL chart, Estuary Expeditions narrows the focus of learning to estuarine environments. The first two columns will be completed in this activity.

Student Activity

Complete the K&W sections of the chart on page 7.

The Value of a Healthy Estuary

Reading Comprehension

Duration
10 min

Materials
Reading Selection – *The Value of a Healthy Estuary*
See Reproducible Master on p.45

Student Workbook p.7

Notes

Instructor Information

Healthy coastal ecosystems are intrinsically linked to the quality of life in our area. The reading summarizes many of the values of estuaries.

Student Activity

1. Introduce the selected reading by discussing the definition of an estuary.
2. Have students read the selection and discuss it.
3. Have students complete Student Workbook p.7.

Science in the Estuary
Checking Vital Signs

Instructor Information

Many people and organizations monitor water quality. The data that researchers, scientists and water managers collect is vital to understanding the health of our watershed. By examining the physical chemistry of water, we can learn a great deal. To make it easier for scientists to share data, a standard set of water quality tests has been established. The four indicators that your class will collect data for include *pH, dissolved oxygen, water temperature, and salinity*. While the exact definitions for these properties are important to understand, the Checking Vital Signs activities focus more on understanding and analyzing data to predict trends and solve problems

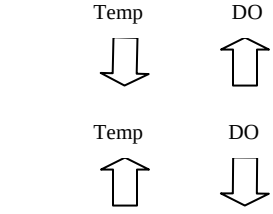
Your classroom will be provided with a duplicate set of the water testing tools used at Rookery Bay. Please introduce these instruments to your students and practice using them prior to the trip.

Physical and Chemical Characteristics of Water

The measurement of water's **pH** is actually a measurement of the amount of hydrogen ions in the sample. This can also be thought of as a measurement of acid vs. base. It is measured on a scale of 1-14 with 7.0 being considered neutral. The more hydrogen ions, the more acidic the sample and the LOWER the pH. Conversely the fewer hydrogen ions, the more basic the sample and the HIGHER the pH. Generally in the Rookery Bay estuaries a low pH will be associated with an influx of fresh water containing a higher concentration of tannic acids. A high pH will be associated with an increase in salt water from the Gulf containing bicarbonate buffers.

Dissolved oxygen (DO) is obviously a measure of the amount of oxygen dissolved in a given quantity of water. It is typically measured as milligrams per litter (mg/L). DO will fluctuate based on daylight/darkness due to the photosynthesis that takes place by submerged plants. In daylight they take in carbon dioxide and put out oxygen, while at night this process is reversed. Also windy weather will "froth up" water which increases dissolved oxygen, and cool water will contain higher levels of DO than warm water. DO is extremely important to all the life forms that need it for respiration. Water with a high DO will support greater numbers and diversity of life than water with a low DO.

Relationship between water temperatures and DO



Water temperature can be measured in degrees Fahrenheit or Celsius. Celsius is preferred for scientific purposes. Water temperature can vary due to a variety of factors such as time of day (daylight/dark), time of year (winter/summer), weather (hot/cold, calm/windy, sunny/cloudy), and tides (high tide more water from the gulf/low tide more water from inland sources). Also, cooler water will typically contain a higher percentage of dissolved oxygen (DO) than warmer water if all other factors remain the same. Water temperatures vary dramatically in estuaries and estuarine plants and animals have adapted to these radical fluctuations.

Salinity is a measure of the total amount of dissolved salts, normally indicated in parts-per-thousand, that are contained in the water sample. Perfectly fresh (distilled) water would have a salinity of 0.0ppt. Seawater in the Gulf of Mexico may have a salinity of 45.0ppt. Estuaries typically contain a constantly changing mixture of fresh and salt water. If there is a great deal of rain, salinity will decrease. During the dry season salinity typically increases. Other factors that effect salinity can be wind speed and direction, tides, and the operation of water control structures on tributary streams. Again it should be noted that estuarine life forms have to adapt to drastic changes in their environment as salinity, DO, pH and temperature continually fluctuate.

Clarifying the Waters
Making Sense Out of Water Quality Parameters

	Definition	Measurement	Significance	Influencing Factors	Rookery Bay Ranges
Water Temperature	A degree of hotness or coldness measured on a definite scale	Celsius degrees preferred for scientific investigation	Varies dramatically in estuaries	Time of Day Season Weather Tides	11 – 39 degrees Celsius
PH	The amount of hydrogen ions in sample	Scale 1-14 7.0 = neutral <7 = acidic >7 = basic	Relatively stable in healthy estuaries	Influx of fresh water decreases PH Increase in salt water increases PH Pollution	6.5 – 10.0
Dissolved Oxygen	The amount of oxygen dissolved in a given quantity of water	Milligrams per liter, mg/L	Higher levels of DO will support greater diversity of life	Water temperature Day/night Wind speed Nutrient pollution	0.00 – 13.0 mg/L 1 – 185 % saturation
Salinity	The total amount of dissolved salts contained in a given quantity of water	Parts per thousand, Ppt	Levels are constantly changing in estuarine environments	Rainfall, drought, wind speed & direction, tidal flow Water control structures	0.00 – 42.0 Ppt

Exploring Salinity

Duration
20 min

Materials
Paper cups-3 per group
Paper clips-1 per group
Salt
(Min. 1 cup per group)
Measuring cup
Warm water
Timer (seconds)

Student Workbook
pp. 12 & 9.

Notes

Instructor Information

This lesson will help students develop understanding of the salinity ratio and provide an opportunity to practice using a scientific tool.

Student Activity

1. Introduce vocabulary-**salinity**.
2. Tell students that this lab will investigate salinity.
3. Divide students into groups of three.
4. Each group will need the following materials
   - One cup of salt (min.1C.)
   - One cup of water
   - One empty *paper* cup
   - One paperclip, straightened
5. Explain that when scientists look at salinity levels, they measure a ratio. The ratio for salinity is expressed in parts per thousand (PPT). This experiment will help them understand what this means.
6. Assign one of the following numbers to each group.
   - 5, 20,35 – these numbers will represent the grams of salt per thousand of the three categories of water, fresh, brackish and saltwater.
7. Using the paperclip, ask students to carefully punch the number of holes assigned through the bottom of the empty cup. The holes represent the number of parts in the salinity ratio.
8. Have students position the cup with holes above the cup with water. During the experiment, the student must hold this cup very still to get accurate results.
9. Have the student with the salt quickly pour all the salt into the cup with holes and immediately begin timing the experiment.
10. Allow the salt to flow into the water for 10 seconds, and then quickly remove the salt cup. Be prepared for the mess!
11. Allow student time to make observations, comparing and contrasting the three solutions.
12. Show students the instrument they will be using to measure salinity and explain how it functions.
13. Test the salinity of your samples and have students record, graph and label the class data in the Student Workbook, page 9.

Where Fresh Water and Salt Water Mix

Duration
15 min

Materials

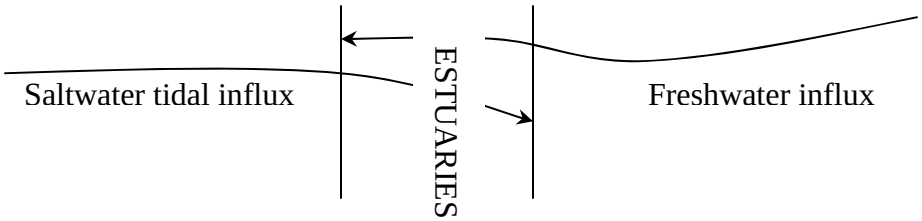
Clear Plastic Cups-2 per group
Salt
Water
Yellow & Blue food dye

Student Workbook p. 9

Notes

Instructor Information

When fresh and salt water meet, the two do not readily mix. Incoming salt water is pushed underneath freshwater in estuarine environments that experience tidal flow because salt water is denser. The flow of freshwater is forced over the top. This is often called a saltwater wedge.



Student Activity

1. Review vocabulary
2. Explain to students that in this lesson, the class will create a model to observe what occurs when fresh and saltwater mix in the estuary.
3. Fill one cup with warm water. Have students create a saturated salt solution (keep adding salt until it will not dissolve). Color this water with blue dye.
4. Fill another cup with fresh warm water and color it yellow
5. Very slowly, ask students to pour the blue ocean water into the cup of yellow fresh water.
6. Discuss and record observations on p. 9 of the Student Workbook.
7. Have students complete the last question on p. 9 and discuss. Possible answers might include rain, hurricanes/storm surge, lack of freshwater flowing to the sea (drought conditions)

What should happen!

The density of the blue salt water is heavier than fresh water. If students pour the blue water carefully it should sink directly to the bottom of the yellow water. Any place where they mix becomes green, indicating brackish water.

Mr. McGregor's Catch

Using science to help make predictions

Duration
15 min

Materials
"Clarifying the Waters" chart
Document Camera

Student Workbook p.10

Notes

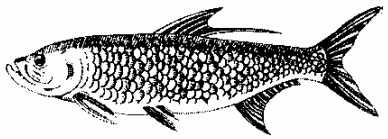
Instructor Information

This reading comprehension activity gives students an opportunity to analyze data and draw conclusions.

Student Activity

1. Write the vocabulary word salinity on the board. Explain that it is only one of four water tests to be performed at Rookery Bay.
2. List water temperature, dissolved oxygen (DO), and pH on the board and ask students if they can explain any of these factors.
3. Display or copy and distribute the "Clarifying the Waters" chart provided on p.19 of this guide. Review contents of chart.
4. Explain to students that different people monitor water parameters for different reasons. Can they think of any?
5. Have student turn to Student Workbook p.10.
6. Mr. McGregor collects and analyzes data to predict trends and help him understand fish populations.
7. Have students read the passage and follow directions.
8. Discuss

Tarpon *Megalops atlanticus*
Length: up to 90"
To most fishermen, the tarpon offers the best challenge around for its explosive reaction to being hooked. It is a powerful and wary, 40 to 200 pound dynamo. Also called the silver king, it is silver with a dark back. Its large mouth has a protruding lower jaw. Its single dorsal fin has a long ray, and its body scales are large. The adult tarpon spawns offshore and its eggs and larvae are carried into estuaries and bays where the juveniles are most often found.



Solution Solutions

Using science to solve problems

Duration
15 min

Student Workbook p.11

Notes

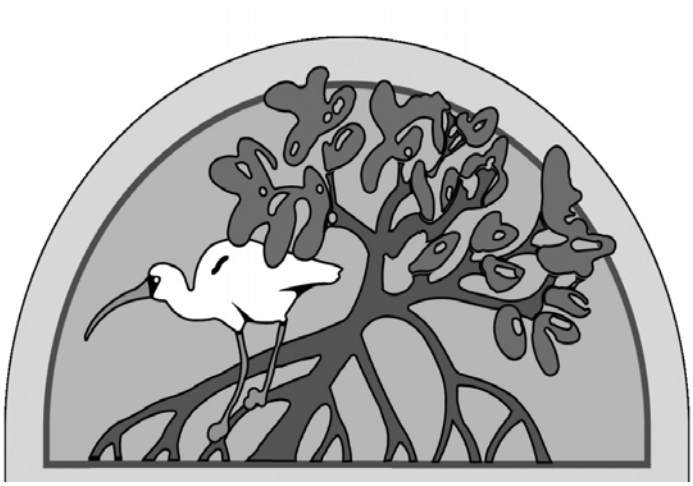
Instructor Information

Students will be extracting information from a reading and applying parts of the scientific method. If your students need to review the steps and definitions of scientific inquiry, do so prior to this lesson.

Steps to the Scientific Method
Observe
Formulate a hypothesis (an educated guess)
Gather & record data to test the hypothesis
Analyze
Draw a conclusion

Student Activity

1. Tell students that some things seem to be changing at Rookery Bay. The education department has asked for their help.
2. Display or copy and distribute the "Clarifying the Waters" chart provided on p.19 of this guide.
3. Direct students to read the passage on p.11 of the Student Workbook and complete the page, using the chart for assistance.
4. Discuss students work
5. Discuss why it is important to monitor water quality. Who is interested in the data?



Field Work
at
Rookery Bay
National Estuarine
Research Reserve

Hands on Explorations & Investigations

The Environmental Learning Center
The Banks of Henderson Creek
The Box Turtle Trail

Timing is everything!

Please keep track of the day's schedule so all activities are completed. If your group has extra time, additional activities and computations are included in the Student Workbook.

Environmental Learning Center Agenda

Logistics

Before your group enters the exhibit area, split students into three groups. An adult should accompany each group during these activities. Once groups are established, continue to the Mangrove Tank, located on the far side of the room.

Mangrove Tank Orientation **Duration 10 minutes**

Allow students time to observe the animals in and around the mangrove tank.
Questions

1. What makes the mangrove tree different from an oak or palm tree?
   The trees take root in the water while their leaves stay above the water.
2. Mangroves live in salt water, 10x saltier than most other land plants could tolerate. How have mangroves adapted to live in salt water?
   They either prevent the salt from entering their roots in the first place, or they get rid of the extra salt through their leaves.
3. Direct students to observe the exhibit as a whole: estuary floor to treetop canopy. What makes the mangrove forest a good home?
   Shade from the sun, protection from predators, abundant food sources, etc. Answers will vary.
4. More than half of the original mangrove forests are lost. Why would it be important to protect these special ecosystems?
   Important habitat for animals, nursery for fish and shellfish, protects our shorelines from storms, etc. Answers will vary.

Watershed Mini-Clips **Duration: 5 minutes**

These one-minute animated features highlight the water cycle, human population growth, and the Everglades ecosystem. Students should stand to see the graphics.

Polka-Dot Batfish **Duration: 2 minutes**

This beauty is the ELC mascot! She will teach your students how to take advantage of the interpretive panels while completing the remaining activities in the ELC. Note how the panels tell you more about the exhibit as well as some things you can do to help protect estuaries.

The ELC Answer Hunt **(SW p. ??)** **Duration: 10 minutes**

Protecting Coastal Resources **(SW p. ??)** **Duration: 8 minutes**

Estuary Inhabitants **(SW p. ??)** **Time Permitting**

Note on Logistics - The first group in the Center will need to pick up the equipment box for the outdoor activities at the visitor services desk. The second group will be responsible for returning this box at the end of the day.

Add a map of the exhibits

The ELC Answer Hunt

Students explore the estuary through the ELC exhibits

Duration
10 min

Student Workbook
pp. 13 & 14

Notes

Instructor Information

Students search for correct answers by reading the interpretive signs and investigating each exhibit.

Student Activity

1. Have students turn to pp. 13-14 in their workbooks.
2. Challenge groups to find as many answers as they can in 10 minutes. The questions are ordered logically to avoid overcrowding at any exhibit. Stagger the starting points for each group. An adult should accompany each group.
3. Back at school, see which group has the most correct and deem them the Top Explorers. Answers are provided on p.38 in the Teachers Guide.

Protecting Coastal Resources

Students will discover how they can take action

Duration
10 min

Student Workbook
p. 15

Notes

Instructor Information

At each exhibit, the interpretive signs include ways everyone can help protect coastal resources.

Student Activity

1. Have students turn to p.15 in their workbooks.
2. Explain that there are many ways they can be stewards of the estuary. All the answers are available on the interpretive signs at each exhibit.
3. Complete the activity by reading information at each exhibit.

Estuary Inhabitants

Students learn about residents of the estuary

Duration
Variable

Student Workbook p. 16

Notes

Instructor Information

If time permits, this activity may be completed at the Learning Center. If students need more time to complete the previous activities, research these animals and complete the activity after returning to the classroom.

Student Activity

1. Have students turn to p. 16 in the Student Workbook.
2. Send teams to find the answers to questions about the specific animals highlighted in the Learning Center

Henderson Creek Agenda

Instructor Information

All the data and equipment to complete these sampling exercises is contained in the Estuary Expedition Equipment Box. Many classes share this resource kit. Please clean and dry all the items with the towels provided, before returning them to the box.

Safety Considerations

You may spot several different animals in or around Henderson Creek. All the students will be drawn to the dock. For safety sake, please only allow one adult and four students on the dock at any given time and keep students back from the mangrove fringe.

Atlantic Needlefish, *Strongylura marina*, are commonly seen near the Reserve's dock.

Student Assignments

These investigations will be more successful if you assign students to teams PRIOR to your fieldtrip. Have them review their responsibilities before leaving school so they can be confident and efficient during their fieldwork data collection. Record your teams below.

Vital Signs

Temperature Team
Sampler:

Tester:

Recorder:

Meteorologist:

Dissolved Oxygen Team
Sampler:

Tester:

Recorder:

PH Team
Sampler:

Tester:

Recorder:

Salinity Team
Sampler:

Tester:

Recorder:

Lab Managers- Responsible for set up and break down of lab area.

Diversity & Growth

Sample A Team
Sampler:

Tester:

Recorder:

Sample B Team
Sampler:

Tester:

Recorder:

Sample C Team
Sampler:

Tester:

Recorder:

Sample D Team
Sampler:

Tester:

Recorder:

Lab Managers:

Checking Vital Signs

Water quality data collection

Duration
10 min

Materials
Science in the Estuary
Equipment Box

Student Workbook p. 17

Notes

Instructor Information

Students will be testing the water in Henderson Creek for temperatures, salinity, DO and pH, using techniques practiced or learned about in class. Prior to your arrival the Rookery Bay docent should have left a sheet for you at the information desk with current weather conditions. If it is not there, use your thermometer and your best judgment. Assign jobs to students PRIOR to your trip.

Student Activity

1. Check to see that all students remember their assigned roles.
2. Assist Lab Managers with set up of lab tables.
3. Have students turn to Student Workbook, p. 17 and look at the data they will be collecting.
4. Have the samplers go out on the dock and collect 4 water samples and bring them back to the lab table.
5. Have testers complete the testing procedure.
6. Recorders should write the results in the Student Workbook.
7. Have the meteorologists obtain the weather data.
8. Allow all members of the group time to record the weather and water data in the Student Workbook.

The Epi Family: Flora & Fauna

A look at epiflora and epifauna in the estuary

Duration
15 min

Materials
Science in the Estuary Equipment Box

Student Workbook
p. 18

Notes

Instructor Information

Plants and animals that attach themselves to surfaces under water fall into the category of epiflora (plants) and epifauna (animals). This activity offers an opportunity for students to observe, weigh & record data for encrusting organisms that have attached themselves to four submerged clay flower pots. Depending on time, students can complete the calculations at Rookery Bay or upon returning to the classroom.

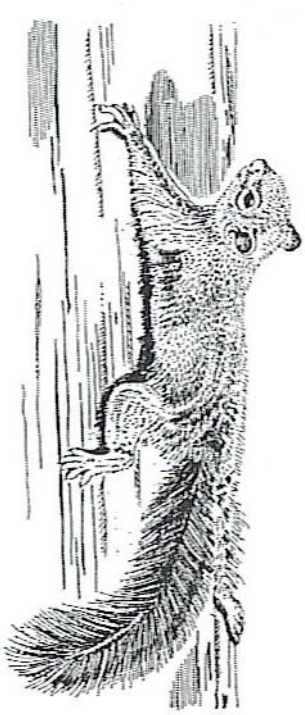
.

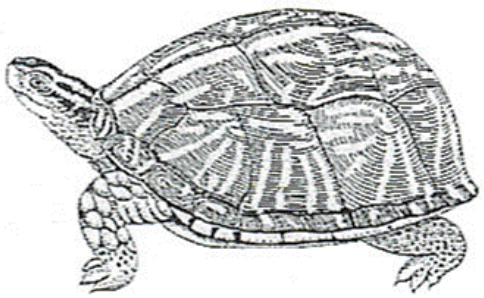
Student Activity

1. Explain that for the next activity, they will be examining encrusting organisms (epiflora and epifauna).
2. Introduce students to the organisms they may encounter using the ID cards provided in the equipment box.
3. Explain that they will be calculating the growth of encrusting organisms over time by weighing samples. Four clay flower pots were hung in Henderson Creek at two-week intervals.
4. Ask if any students can think of reasons why it would be important to learn about how quickly these organisms grow.
5. Have students go to Student Workbook p .18, and look at the data they will be collecting. Have them record the mass of the weighing pan and the beginning mass of the sample substrate used to start these colonies. This information is in the equipment box.
6. Have four students go to the dock and carefully retrieve the samples. Allow a few seconds for them to drip off before returning to the lab tables. They are easily broken so students must handle with care.
7. Sample #4 should have little or no growth on it. This pot is covered in anti-fouling paint. Ask if students know why this kind of paint is necessary. (Organisms can weigh vessels down, exotic invasives might "hitch hike") Who might use it? (Recreational boaters, marine researchers, coast guard boats, ferry boats, freighters, etc.)
8. Have students weigh each sample and record data.
9. Allow students time to examine and identify the diversity of life forms attached to the samples. Look inside and outside the pot.
10. Return the pots to the water and complete the calculations on p. 18 while still at Rookery Bay or back in the classroom.

Logistics

When this activity station is over and equipment is clean and returned to the Science in the Estuary Equipment Box, take a brief restroom and water break.
Follow the gravel drive beside the ELC to the bridge where a Rookery Bay naturalist will meet you and groups will switch.





Box Turtle Trail Hike

A Rookery Bay naturalist will guide your class through a unique upland trail.

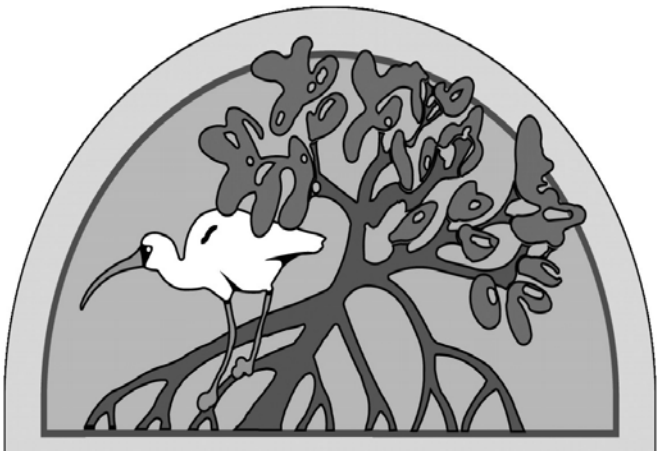
Naturalists will …

1. Help students identify many native upland plants and discuss their benefits to people and wildlife.
2. Reveal the impact of invasive exotic species.
3. Reinforce the concept of connectivity in nature.
4. Supply fascinating factoids and stories about the historical significance of the upland habitats in south Florida.

Duration
60 min

Materials
Water bottle

Notes



After the Fieldtrip Classroom Enrichment, Data Analysis & Assessment

Putting it all together

Student Assignments

On the way back to school

- ✓ **Finish Field Work Calculations**
  Student Workbook pp. 17-18
- ✓ **Rookery Writing**
  Choose writing assignment and brainstorm
  Finish as homework
  Student Workbook p. 19
- ✓ **Estuary Impressions**
  Read and plan for "Rookery Bay-Yours to Enjoy, Explore and Protect"
  Finish as homework or in classroom
  Student Workbook p.20

This is Our Watershed

Adding Details to Your Map

Duration
Variable

Materials
Watershed Poster
Colored Pencils
Fine Tip Markers

Enrichment
Students can analyze available water quality data, habitat cover, aquifer boundaries, etc. and create their own key symbols

Try *pointillism*, a technique made famous by Georges Seurat in the 1800's that uses many small dots to create a large picture.

Instructor Information

This activity extends the pre trip watershed-mapping lesson.

Student Activity

1. Display the watershed map poster provided with this guide. And tell students that they will be adding more detailed information to their watershed maps.
2. Ask students to look at the map key. Has anything been added? (Yes, 3 new pieces of information have been added)
3. What do students think they might represent? (Salinity/ppt)
4. Have a student point out Rookery Bay.
5. Ask if anyone remembers that type of water that they found in Henderson Creek. (Brackish)
6. Which symbol represents brackish water? Fresh Water? Salt Water? Why? (The dots represent concentrations of salt)
7. As a class or when time permits allow students to recreate the watershed map, adding the new symbols to the appropriate areas.

Checking Vital Signs

Post water quality data and comparative analysis

Instructor Information

Note: At the time of printing, directions for posting your water quality test results and options for comparative analysis were unavailable. You will receive this information as an addendum to this Guide when it becomes available.

Science Finding Solutions

Students Solving Problems

Duration
15 min

Materials
Fish Kill Story

Instructor Information

The reading selection and accompanying questions can be found in the reproducible section of this guide.

Student Activity

1. Pass out copies of reading selection "*Massive Fish Kill Discovered in Henderson Creek*" (p. 46 of this guide).
2. Students should read the article and answer the questions provided.
3. Discuss.

Captains of Conservation

Stewards of the Estuary

Instructor Information

Stewardship is an important component of Rookery Bay's mission. During this unit, students learned many ways to help the environment. This project will help them synthesize what they have learned. Assessment criteria are provided in the reproducible section of this guide.

Student Activity

1. Review some of the conservation practices that benefit coastal resources.
2. Challenge students to create a brochure, poster or commercial, persuading people to help the estuaries.
3. Have students present their projects to the class.

Estuary Experts

Tying up loose ends

Duration
25 min

Student Workbook p.7

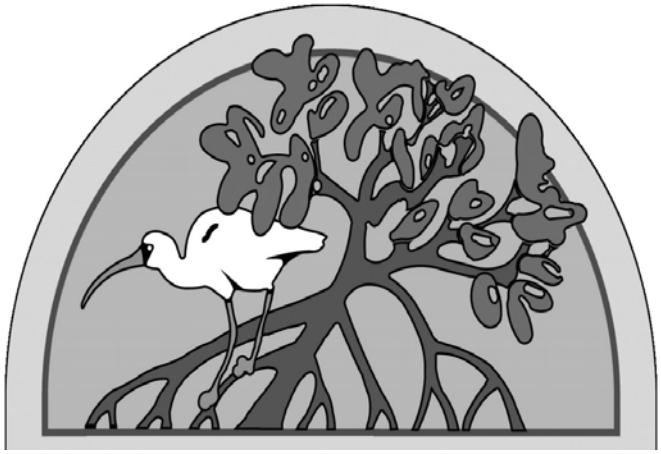
Student Activities

1. Complete the "What you learned" section on p. 7 of the Student Workbook
2. Take Post Test (www.test.ccps)

Art Extensions

Each year, in affiliation with The Library of Congress Center for the Book, River of Words conducts a free international poetry and art contest for youth on the theme of watersheds. The contest is designed to help youth explore the natural and cultural history of the place they live, and to express, through poetry and art, what they discover.
http://www.riverofwords.org/contest/index.html

Watersheds in art! Auguste Renoir, Winslow Homer, Gustave Courbet, and Maurice Brazil Prednergast are just a few of the thousands of artists that have included rivers, bays, marshes, and oceans in their artwork! Make copies of famous watershed paintings and display them on a wall. Locate the watersheds depicted in the paintings on a world map or globe.
www.nga.gov



Teaching Resources

Answer Keys

Assessment Criteria

References & Literature

Reading Comprehension

Chaperone Information Sheet

Estuary Etiquette for Explorers

Program Assessment & Educator Incentives

The ELC Answer Hunt

Student Workbook pp.13-14

Answer Key

1. Which animal is considered a master of camouflage?
   Polka-dot Batfish
2. What caused the osprey population to decline during the 1950's and 1960's?
   Pesticides such as DDT
3. What are two reasons that controlled burns are done?
   Stimulate new growth & seed production; opens areas for feeding & travel.
4. How do you minimize erosion in your yard?
   Plant native ground cover; use mulch on exposed soil.
5. Name two invasive plants found in Rookery Bay.
   Australian Pine, Brazilian Pepper, Melalluca
6. Explain why the space between oyster shells are a habitat for small creatures.
   They provide hiding places and the oysters provide food for some animals.
7. How can run-off from a canal affect the estuary?
   It can introduce contaminants or it can reduce oxygen and kill some species.
8. The endangered manatee can grow up to 180 inches long. How many feet is that?
   15 ft.
9. Rookery Bay has a rule of "leave no trace" whenever visiting the Reserve. Explain what this means.
   Take only pictures and leave nothing behind.
10. What tool is used to check water clarity?
    Secchi disk
11. Which fish has spines on its body and can inflate itself by taking in water or air?
    Striped Burrfish
12. How does a pipefish blend in with the sea grass habitat?
    It hangs vertically like grass.
13. Why does the temperature in a backwater bay fluctuate throughout the day?
    Because they are shallow and easily influenced by the weather.
14. What is a data sonde?
    An electronic sensor that records water quality parameters every 30 minutes (temp., salinity, pH, depth, turbidity and DO).
15. What do you call creatures that build shells?
    Mollusks (either univalves or bivalves)
16. Which tern is the smallest tern in North America?
    Least tern
17. Why do terns migrate to Florida in April?
    In search of quiet beaches and sandbars for nesting.
18. How do barrier islands protect the mainland during storms?
    They absorb most of the impact from the storms.
19. Name four creatures living in the red mangrove exhibit.
    Rosette spoonbill, acorn barnacle, periwinkle snail, mangrove tree crab, white ibis, snowy egret, tricolored heron.
20. How many mangrove species are native to this area?
    Three – Red, black, and white

Protecting Coastal Resources

Student Workbook p.15

Answer Key

1. What does the *Polka Dot Batfish* exhibit tell you about how to fish respectfully?
   Follow "catch & release" practices and work to protect fish habitats.

2. Look at *Rookery Bay's Least Wanted* exhibit and explain how you can encourage natural biodiversity.
   Use wildlife friendly native plants in your landscape.

3. The *Mudflat Monitoring* exhibit tells you to "Think before you pour". Why?
   Many hazardous products used around the house end up in estuaries. Use non-toxic alternatives.

4. The *Manatee for Humanity* exhibit says that you should never do three things to manatees. What are they?
   Keep your distance, never touch, feed or give them water.

5. In the *Barrier Island* exhibit it recommends that you do something before you take a shell home. What is it?
   Ensure it is unoccupied OR better yet, leave it behind for others to enjoy.

6. The *Your Tern to Protect* exhibit mentions some things you can do to protect beach nesting birds. What are they?
   Respect posted areas, use designated trails & keep pets on a leash.

7. The *Mangrove Forest* exhibit tells us to keep watercraft away from mangrove rookery islands. Why?
   So that colonies of nesting birds are not disturbed.

Assessment Criteria
Captains of Conservation

Scoring Scale	
5	EXCELLENT
4	VERY GOOD
3	AVERAGE
2	BELOW AVERAGE
1	NOT SATISFACTORY

Assessment of Content

- ❑ Clearly states at least one current conservation issue
- ❑ Supports the need for conservation with facts
- ❑ Offers a minimum of three actions people can take to help
- ❑ Logical progression of information
- ❑ Demonstrates depth of knowledge
- ❑ Able to answer questions

Assessment of Research Skills

- ❑ Uses a minimum of three varied resources
- ❑ Cites sources
- ❑ Avoids plagiarism

Assessment of Visual Presentation

- ❑ Helps explain the issue(s)
- ❑ Includes appropriate graphics that serve a purpose
- ❑ Pleasing color scheme and visual transitions
- ❑ Lettering is easy to read

Assessment of Oral Presentation

- ❑ Good eye contact
- ❑ Appropriate volume
- ❑ Demonstrated ease with topic
- ❑ Answers questions politely
- ❑ Smiles and shows enthusiasm for the subject
- ❑ Does not read the entire visual

Internet References for Educators

About Rookery Bay and its Partners
http://rookerybay.org/ - Friends of Rookery Bay
http://www.estuaries.gov/ - National Oceanic and Atmospheric Administration
http://www.education.noaa.gov/ - NOAA Education Resources
http://www.dep.state.fl.us/coastal/ - Florida Coastal and Aquatic Managed Areas
http://nerrs.noas.gov/ - National Estuarine Research Reserve System
http://www.masternaturalist.org/ - Florida Master Naturalist Program

References and Research
http://www.whatsanestuary.com - Association for National Estuaries Programs
http://www.sfwmd.gov/site/index.php? - South Florida Water Management District
http://gulfsci.usgs.gov/ - US Geological Survey, Gulf of Mexico Integrated Sciences
http://sofia.usgs.gov/ - US Geological Survey, South Florida Information Access
http://fl.water.usgs.gov/ - US Geological Survey, Water Resources of Florida
http://floridaconservation.org/ - Florida Fish and Wildlife Conservation Commission
http://www.floridamarine.org/ - Florida Marine Research Institute
http://www.epa.gov/owow/ - EPA, Wetlands, Oceans and Watersheds

Educator Resources
http://www.marine-ed.org/ - National Marine Educators Association
http://www.vims.edu/bridge/ - Ocean Sciences Teacher Resource Center
http://floridaenvironment.com/ - Florida Environment Radio Program
http://www.greenfrognews.com/index.html - Good teaching activities
http://eelink.net/sitemap.html - Best general environmental education website

Cool Sites to Visit
http://www.worldwatermonitoringday.org/index.html - World Water Monitoring Day
Join in Sept 18-Oct 18, 2004.
http://www.riverofwords.org/contest/index.html - Watershed Art & Poetry Contest
www.nga.gov -National Gallery watersheds in art!

Freebies & More!
http://www.epa.gov/owow/estuaries/kids/resource/pubs.htm - FREE Estuary Posters
http://www.aquat1.ifas.ufl.edu/ - Free posters and lessons about native & exotic plants

Links to Florida Aquariums
Clearwater Marine Aquarium – Clearwater
Florida Aquarium - Tampa Bay
Key West Aquarium - Key West
Mote Aquarium - Sarasota

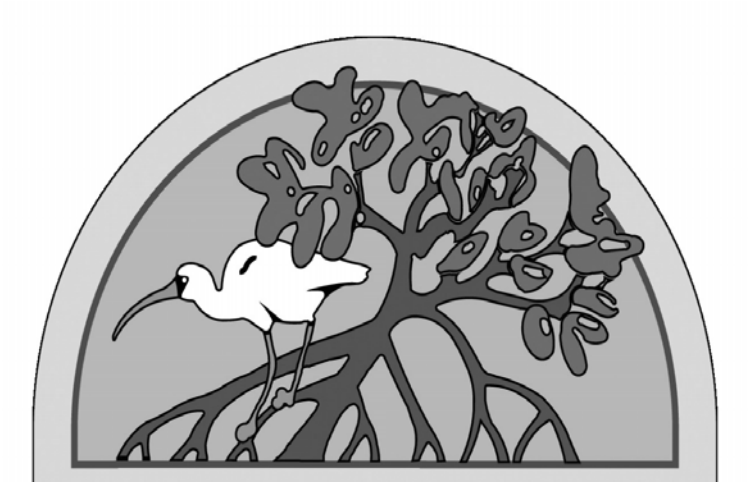
Internet Resources for Students

http://rookerybay.org/ - Friends of Rookery Bay
http://nerrs.noas.gov/ - National Estuarine Research Reserve System
http://ology.amnh.org/index.html - Awesome sight packed with interactive games!
http://www.epa.gov/owow/estuaries/kids/resource/pubs.htm - FREE Estuary Posters
http://www.riverofwords.org/contest/index.html - Watershed Art & Poetry Contest
http://www.nps.gov/plants/alien/ - Weeds gone wild alien invaders
http://www.fleppc.org/ Florida exotic pest plant council
http://www.epa.gov/owow/estuaries/kids/ - EPA for kids
http://www.onr.navy.mil/focus/ocean/default.htm - Naval Research Science & Technology
http://interactive2.usgs.gov/learningweb/students/index.htm - USGS Learning Web – great site for research pictures, map, basic water info and activities
http://eelink.net/sitemap.html - Great environmental education resource site

Students' Literature

(helpful for teachers as well)

Title	**Author**
Discover Nature at the Seashore	Archer Lawler
One Small Square: Seashore	Wynne Silver
A Journey into an Estuary	Rebecca L. Johnson
Did You Ever Wonder About Things You Find at the Beach?	Vera Vullo
Seashells, Crabs and Seastars	Christine Kump Tibbetts
Frogs, Toads and Turtles	Diane L. Burns
Young Peoples Book of Oceans	David Lambert
Sea Turtles	Jeff Ripple
Manatees: Natural History and Conservation	James Powell
Awesome Ocean Science	Cindy A. Littlefield
The Florida Water Story	Peggy Sias Lantz & Wendy A. Hale
The Young Naturalist Guide to Florida	Peggy Sias Lantz & Wendy A. Hale
The Seaside Naturalist	Deborah A. Coulombe



Estuary Explorers Reproducible Masters

The Value of a Healthy Estuary

Estuaries are very important places. They exist where fresh water that drains from the land blends with the salt water from the sea. At Rookery Bay Reserve our estuary contains a special kind of forest. This forest actually grows right out into the water, and the trees that grow here are called mangrove trees.

Mangrove trees are important for several reasons. Their leaves continually fall into the water where they slowly rot. These rotting leaves are called detritus and this detritus serves as food for a variety of microscopic plants and animals. These in turn become food for other creatures like snails, shrimp and small fish. The mangrove trees also provide hiding places for small animals, both below and above the water. The fact that estuaries support such a wide variety of young creatures is why they are called the “nurseries of the sea”.

Estuaries are also important for several other reasons. They help protect our homes from storm waves created by tropical storms and hurricanes. Estuaries offer many kids of recreation such as fishing, boating, bird watching and just relaxing in nature. They are home to a variety of rare species such at manatees, crocodiles, orchids, eagles and sawfish. The Rookery Bay estuary helps filter polluted water that runs off the land. And finally, many of the seafood items that we enjoy live all or part of their lives in the estuary. As you can see, there are many good reasons why we need to protect the health of our estuaries.

Massive Fish Kill Discovered in Henderson Creek

Scientists Working To Determine The Cause

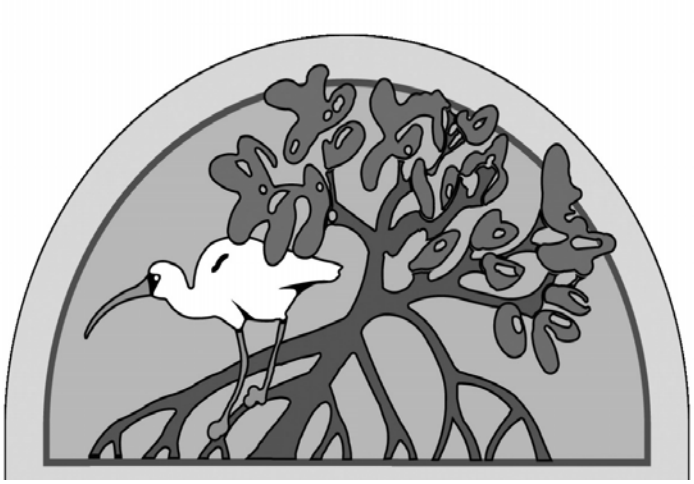
On Monday, August 24th a staff member at Rookery Bay National Estuarine Research Reserve discovered a mass of dead fish floating in Henderson Creek. Marge Inovera, the education coordinator at the Reserve, said that she was preparing for the arrival of a group of fourth grade students when she noticed the fish floating belly up in the creek.

An investigation is underway to determine the cause of the fish kill. The Henderson Creek watershed contains a large number of farm fields, golf courses, and housing developments where septic systems are used. Scientists are trying to determine if some sort of pollutant might have entered the creek and killed the fish. August 24th was one of the hottest days of the year and temperatures hit 99 degrees in Naples. Tests indicate that the dissolved oxygen in the creek was extremely low on the day the fish were discovered. Scientists are currently working on a hypothesis that can help to explain this event.

Please answer the following questions:

1. What connection could there be between farm fields, golf courses, or housing developments and the fish kill?
   _____
   _____
   _____
2. What kind of pollutant might have entered the creek and where did it come from?
   _____
   _____
   _____
3. What does dissolved oxygen have to do with a fish kill?
   _____
   _____
   _____
4. Does temperature effect dissolved oxygen? If so, how?
   _____
   _____
   _____
5. How can science help solve the fish kill problem?
   _____
   _____
   _____

Rookery Bay National Estuarine Research Reserve



Chaperone Guide

Dear Chaperone,

Your role as a chaperone is crucial while your group visits Rookery Bay National Estuarine Research Reserve. You will have the opportunity to help us make your group's visit a memorable, fun and educational experience. The information on this sheet will help you guide your group successfully.

As a chaperone, you will be responsible for ensuring all rules are followed. The rules are on the other side of this page. Students have reviewed these rules before this trip.

Your role as a chaperone

Your group is participating in a structured program called *Estuary Explorers*. Each student has a workbook that they need to complete during this fieldtrip. Your teacher or a Rookery Bay naturalist will be introducing students to all the activities. The best service you can provide is to focus their attention on completing these activities. In the Environmental Learning Center, Each exhibit has an interpretive sign. All the student answers are available from these readings. Please read the signs to the children so they have the opportunity to think about the information, rather than struggling with vocabulary. Encourage them to look, think and ask questions. Don't feel you need to know all the answers! Ask students where they might go to find the answers (observation, other students, interpretive signs, research, staff at Rookery Bay).

At any aquarium you can ask students to:

- ✓ Identify the animals using information provided at the exhibit.
- ✓ Choose an animal and observe to determine how they are adapted for feeding, moving, or protecting themselves
- ✓ Look for an animal that is camouflaged.
- ✓ Compare and contrast two species or habitats

Estuary Etiquette for Explorers

Your class will be sharing Rookery Bay Reserve
with students, researchers, scientists and visitors from around the world.
Appropriate behavior and courtesy are expected.

Rules of Rookery Bay

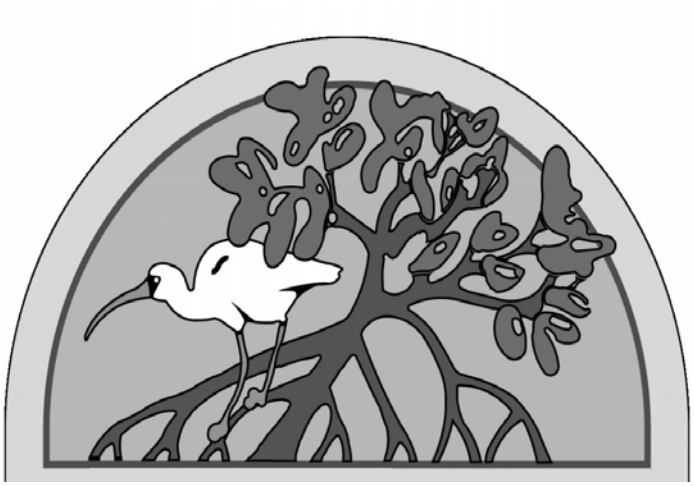
Stay with your chaperone at all times. Do not wander from the group
No running is allowed anywhere at Rookery Bay
Stay on the paths outside. Many native plants are trying to grow
Treat all plants and animals with respect
No climbing on exhibits or art
Do NOT put your hands or other items into the Mangrove Aquarium Tank.
No banging on the glass, it disturbs the animals
Dispose of all trash in appropriate receptacles

Reminders from Rookery Bay

Closed shoes are required on fieldtrip day
Lightweight, long pants are recommended
Be prepared for bugs, sun and heat

Rookery Bay National Estuarine Research Reserve

Program Assessment & Educator Incentive



Randy. What do you want to know and what do you have to give away? Passes, membership, store discount, free field guide (that one would only work for a year if you get repeat teachers.)

Let me know and I'll write it up.